REMARKS

Claims 1-9 and 11-13 are in the application.

Claim 10 has been canceled without prejudice.

Claim 1 has been amended to recite a radio signal that has a preamble comprising short and long synchronization pulses and the step of selecting a candidate angle is completed prior to the reception of the long synchronization pulses of the preamble.

§ 102 Rejections

In the Office Action, claims 1 and 3 were rejected under 35 U.S.C. § 102 as being anticipated by A. Kalis, *et al.*, "Relative Direction Determination in Mobile Computing Networks" (hereinafter "Kalis").

Brief Description of the Present Invention

Briefly, the present invention relates to a technique for controlling a directional angle of a steerable antenna array. According to the technique, the antenna array is configured in an omni-directional mode. A radio signal having a preamble comprising short synchronization pulses and long synchronization pulses is received by the array. As the preamble of a radio signal is received, quality metrics of the received signal are determined and a candidate angle is selected. Selection of the candidate angle is completed prior to the reception of the long synchronization pulses in the radio signal's preamble.

Brief Description of the Cited Art

Briefly, Kalis describes a radio direction finding (RDF) technique that may be used to steer a switched beam antenna array to a direction of arrival (DOA) of an incoming signal within the preamble portion of the incoming signal. See Kalis, Section I, page 1479. According to the technique, the antenna array is initially placed in an omni-directional mode to measure the relative signal strength (RSS) of the incoming signal in an omni-directional pattern comprising "N" sectors. The sector with the best RSS is identified. The antenna is then steered to sub-

sectors within the identified sector and RSS measurements are taken and analyzed in order to converge on a sub-sector where the best RSS is measured. See Kalis, Section II, pages 1481-82.

Differences Between the Claimed Invention and the Cited Art

The MPEP at § 2131 states:

"'A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. '" MPEP § 2131 quoting *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

Representative claim 1 recites:

1. A method for controlling a directional angle of a steerable antenna array, wherein a radio signal received via the array contains a preamble portion and a data portion, the method comprising the steps of:

configuring the antenna array for receiving the radio signal in an omni-directional mode;

receiving an initial part of the preamble;

determining a quality metric of the initial part of the preamble;

setting the array to a candidate angle;

receiving a subsequent part of the preamble;

determining a quality metric for the subsequent part so received;

repeating the steps of setting the array, receiving a subsequent preamble part and determining a quality metric for at least one additional candidate angle; and

selecting a candidate angle based on the quality metrics,

wherein the ***preamble portion comprises short synchronization pulses and long synchronization pulses***, and wherein the step of selecting a candidate angle is completed prior to reception of the long synchronization pulses.

The Applicants respectfully submit that Kalis fails to describe either expressly or inherently the Applicants' claimed ***preamble portion of a radio signal that comprises short synchronization pulses and long synchronization pulses***.

The preamble disclosed by Kalis has 128 symbols and is 128 microseconds (μsecs) in duration. See Kalis, Fig. 1. Although, Kalis does not explicitly state that each symbol is of equal duration, Kalis does seem to suggest that each symbol is 1 μsec in duration. In addition, the measurements of the incoming signal described by Kalis occur over five sample periods wherein each period comprises 16 symbols and is 16 μsecs in length. This further suggests that

each symbol in the preamble has 1 μsec in duration which would make the symbols equal in duration. Moreover, Kalis does not provide any teaching or suggestion to the contrary.

The Applicants, on the other hand, clearly claim a preamble that has short and long synchronization pulses. That is, the Applicants' claimed preamble has pulses of different durations, something that Kalis fails to disclose.

Because of the absence of a ***preamble portion of a radio signal that comprises short synchronization pulses and long synchronization pulses*** in Kalis, the Applicants respectfully submit that Kalis does not render the Applicants' claims 1 and 3 anticipated under 35 U.S.C. § 102. Therefore, the Applicants respectfully request that the above § 102 rejections of claims 1 and 3 be withdrawn.

<u>§ 103 Rejections</u>

In the Office Action, claims 2 and 4-13 were rejected under 35 U.S.C. § 103 as being unpatentable over Kalis in further view of the IEEE Standard 802.11a-1999 titled "Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications High-speed Physical Layer in the 5 GHz Band," hereinafter ("Part 11").

<u>*Brief Description of the Additional Cited Art*</u>

"Part 11" is a supplement to the IEEE 802.1a standard which describes various physical aspects of the IEEE 802.1a standard. Specifically, "Part 11" describes an orthogonal frequency division multiplexing (OFDM) training structure used for the reception of 802.11a Packet Protocol Data Units (PPDUs). <u>See</u> "Part 11," Section 17.3.3, pages 12 and 13. The OFDM training structure includes a Physical Layer Convergent Procedure (PLCP) preamble which is used to synchronize hardware for the reception of 802.1a PPDUs. The preamble has two parts, a short training symbol part and a long training symbol part. The short training symbol part is made up of ten 800 nanosecond symbols for a total length of 8 microseconds (μsecs). The long training symbol part is made up of a single 1.6 μsecs Guard Interval 2 (GI2) symbol and two long training symbols of 3.2 μsecs microseconds in length for a total length of 8 μsecs.

Differences Between the Cited Art and the Present Invention

The MPEP at § 2143 states:

> "To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations."

The Applicants respectfully submit that Kalis taken either singly or in combination with "Part 11" fail to teach or suggest the Applicants' claimed ***preamble portion of a radio signal that comprises short synchronization pulses and long synchronization pulses*** wherein ***the step of selecting a candidate angle is completed prior to reception of the long synchronization pulses***.

As noted above, Kalis fails to teach ***short and long synchronization pulses***. "Part 11" describes short and long synchronization pulses in a preamble, however, combining "Part 11" with Kalis is not feasible and certainly does not yield ***a candidate angle selected prior to the reception of the long synchronization pulses*** in a received radio signal's preamble.

First, in Kalis, each RSS measurement of the incoming signal is made over 16 symbols of the radio signal's preamble. Five measurements are used to steer the antenna to find an optimal pattern for receiving the incoming signal. Thus, it takes 80 symbols of the preamble to steer the antenna to the incoming signal. For the preamble described by Kalis, this does not present a problem because the preamble is 128 symbols in length. Thus, 80 symbols can be easily accommodated and still have symbols left to perform other preamble functions, such as synchronizing an internal clock for the RDF process and setting up for reception of the start frame delimiter (SFD).

However, for the PPDU preamble described by "Part 11," requiring 16 symbols to take a measurement presents a problem. As noted in "Part 11," the short symbol training part of the preamble is used for signal detect, automatic gain control (AGC), diversity selection, offset estimation and timing synchronization. The long symbol training part is used for channel and fine frequency tuning, and offset estimation. See "Part 11," Figure 110 on page 12. The PPDU preamble only has 10 symbols in its short training symbol part. Applying Kalis' technique to the

PPDU described by "Part 11" would cause sampling to occur beyond the short training symbol part which may leave little of no portion of the short symbol part to be used for performing other functions, such as the functions described above. In addition, extending sampling beyond the short symbol part is contrary to what is claimed by the Applicants.

The Applicants' claimed invention completes <u>selecting a candidate angle prior to reception of the long synchronization pulses</u>. That is, the candidate angle is selected during the reception of the short training symbol part but prior to the long training symbol part of the preamble. To better understand this concept, one must refer to the Applicants' specification.

Fig. 8 of the Applicants' specification illustrates the preamble portion of a PPDU having a short training symbol part and a long training symbol part which is similar to the preamble illustrated in Figure 110 of "Part 11"; that is, the short training symbol part is made up of ten short training symbols and the long training symbol part is made up of a single Guard Interval 2 (GI2) symbol and two long training symbols.

As noted above, at the time of the reception of the first long training symbol, the receiver is expected to be performing channel and fine frequency offset estimation and it is probably too late at this point to be changing the antenna directional settings. Thus, any antenna steering must occur prior to the reception of the first long training symbol.

For the above PPDU, this is accomplished in the technique described in Fig. 12 and on pages 10-11 of the Applicants' specification. Here, symbol-by-symbol measurements of the short training symbols are made and the antenna array is steered towards the incoming signal. The entire process is completed within the first 6 short training symbols. This is well within the number of symbols that comprise the short training symbol part of the preamble and certainly well before the first long training symbol.

Neither Kalis nor "Part 11" teach or suggest measuring on a symbol-by-symbol basis. Rather, at best, Kalis describes taking a measurement over a group of 16 symbols which, as noted above, is not workable with the preamble described in "Part 11."

Because Kalis and "Part 11" taken either singly or combined fail to teach or suggest a ***preamble portion of a radio signal that comprises short synchronization pulses and long synchronization pulses*** wherein ***the step of selecting a candidate angle is completed prior to reception of the long synchronization pulses***, the Applicants respectfully submit that Kalis and

"Part 11" do not render claims 2, 4-9 and 11-13 obvious under 35 U.S.C. § 103. Therefore, the Applicants respectfully request that the above rejections of claims 2, 4-9 and 11-13 be withdrawn.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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